

METEOROLOGICAL RADAR SUBSYSTEM (MRS) FOR THE METEOROLOGICAL MOBILE FACILITY, REPLACEMENT MetMF(R)



OVERVIEW

This period of instruction is to familiarize you with the use and operation of the Meteorological RADAR Subsystem (MRS). After this period of instruction you will be able to setup the antennae, know the operating ranges of the AN/TPS-76, how to operate the MRS using the EDGE™ computer software, setup overlays and underlays, and perform various tasks as the operator that are required for the system to perform properly.

LEARNING OBJECTIVES

TERMINAL LEARNING OBJECTIVES

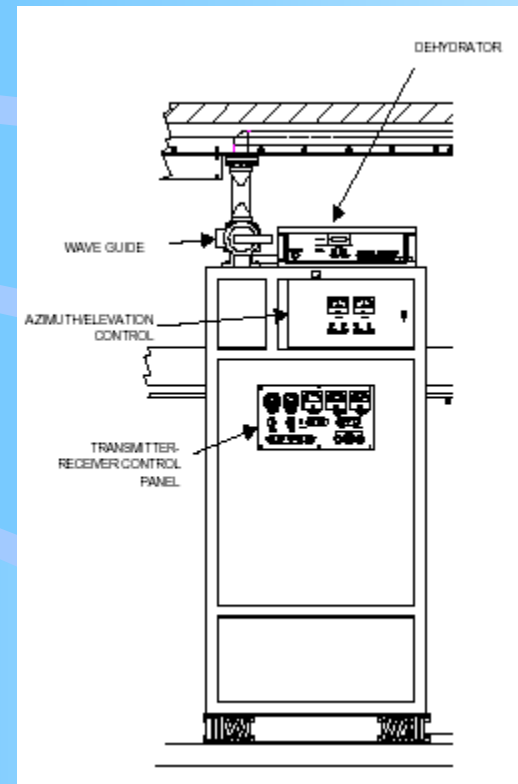
- Setup the AN/TPS-76 RADAR antenna.
- Understand and describe the various tasks done by the operator to include overlay/underlays, level 0 dump, and reload.

ENABLING LEARNING OBJECTIVES

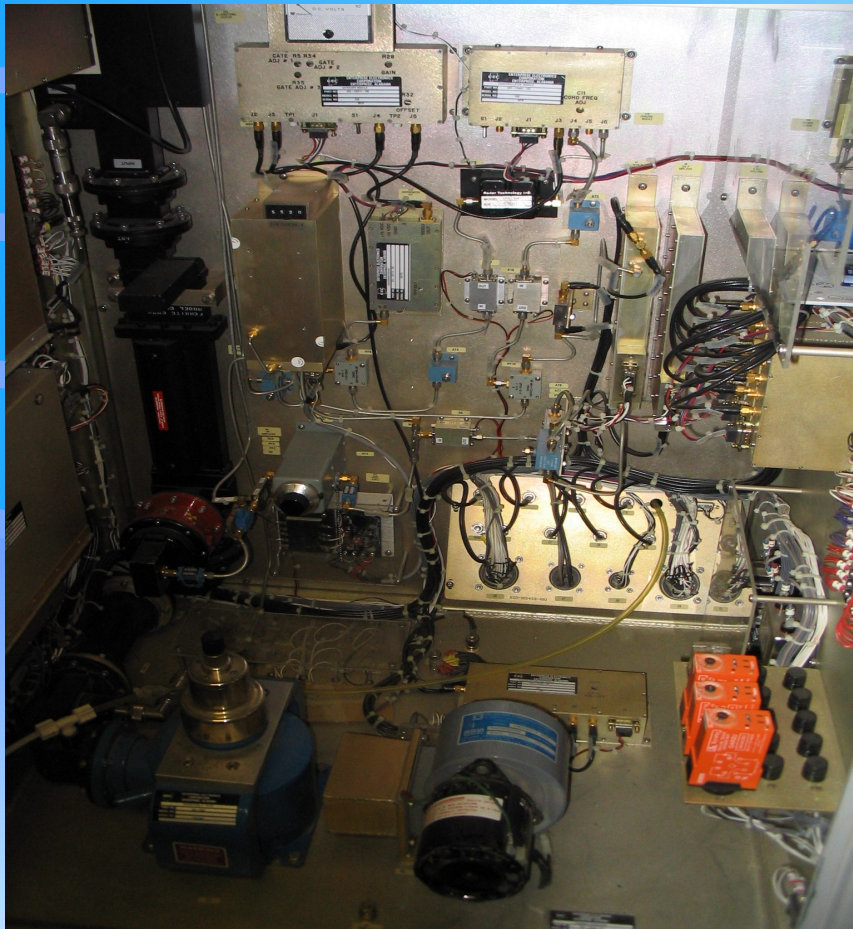
- Interrogate Doppler radar products to forecast inclement weather in support of MAGTF operations.
- To pack up and setup the AN/TPS-76 Radar

TRANSMIT/RECEIVE/SERV O CHASSIS

**Consist of the Transmitter,
Receiver, and Servo.**



TRANSMIT/RECEIVE/SERV O CHASSIS (cont'd)



**Transmitter and
Receiver**

TRANSMIT/RECEIVE/SERV O CHASSIS (cont'd)

- A. The transmitter is the source of the electromagnetic radiation transmitted by the radar. It generates a high frequency signal that leaves the radar's antenna and is projected into space.
- A modulator that switches the transmitter on and off and provides the correct waveform for the transmitted pulse controls the transmitter. Basically, the modulator tells the transmitter when to transmit and for how long.
- The transmitter transmits electromagnetic radiation at a certain predetermined rate called the pulse repetition frequency (PRF). PRFs are measured in pulses per second and are designated in hertz (Hz).

Modulator



TRANSMIT/RECEIVE/SERV O CHASSIS (cont'd)

- B. The Receiver operates by going through a receive cycle which is designed to output log video data (intensity) and I&Q video data (velocity). The receiver detects and amplifies the weak signals received by the antenna. The receive cycle begins after the transmitted pulse and recovery time of the Transmitter/Receiver (TR) Limiter.**
- C. The azimuth and elevation servo amplifier converts the low power DC error inputs into the high power drive for the azimuth and elevation motors. Local control of the antenna position is accomplished with LOCAL maintenance controls at the RCP cabinet. Remote control is accomplished via the operation workstation. The servo is connected to the RCP cabinet by a multi-conductor signal line.**

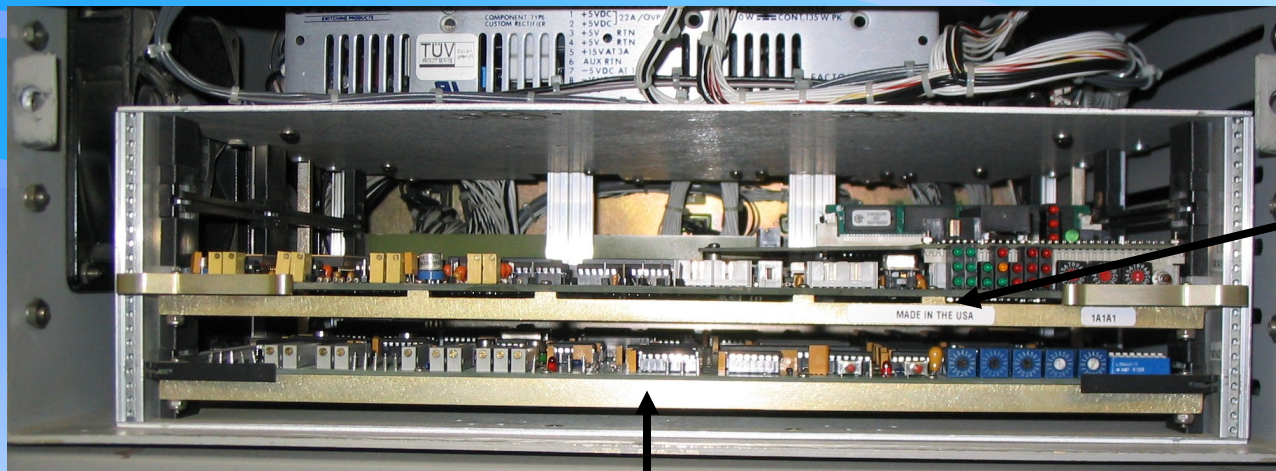
TRANSMIT/RECEIVE/SERV O CHASSIS (cont'd)



Servo
Control

RADAR CONTROL PROCESSOR

- The RCP contains the control and processing circuits of the radar. The RCP consists of the RADAR Control Processor (RCP) Printed Circuit Assemble (PCA), Radar Video Processor (ESP-7), and the RCA Backplane.



ESP-7

RCP PCA

RADAR CONTROL PROCESSOR (cont'd)

- **The operator workstation instructs the ESP-7 to generate the correct Pulse Repetition Frequency (PRF) trigger rate. This trigger is passed through the RCP to the radar transmitter.**
- **The ESP-7 also processes the Log video and “I” and the “Q” videos, from the radar receiver, generating intensity and velocity digital data. This data is passed through the Ethernet Link to the operator workstation. The ESP-7 also generates a linear IF Sensitivity Time Control/Automatic Gain Control and provides this through the RCP to the radar receiver.**
- **The antenna control portion of the RCP receives the antenna position synchro signals from the antenna pedestal and generates drive signals in azimuth and elevation for the servo amplifier. These drive signals are based on where the antenna is pointing and where the antenna has been instructed to point.**

ANTENNA-PEDESTAL

- **The pedestal is an elevation-over-azimuth device with each axis driven by direct current motors with a gear reduction of 240 to 1.**



ANTENNA-PEDESTAL (cont'd)

- **The bearings are pre-lubricated type, requiring periodic lubrication, and the gears are dry-film lubricated requiring only periodic greasing to prevent rust.**
- **The pedestal receives position drive from the servo amplifier, and supplies angle information to the processing and display units. The pedestal assembly has sliprings for coupling azimuth/elevation drive and position feedback. There are rotating joints on both axes for RF power transmission.**

ANTENNA-PEDESTAL (cont'd)

- **The WSR 250-antenna dish is what directs the radar's signal at the target. The antenna is a 6-foot reflector with a front-fire feedhorn mounted at the focal point. The antenna dish actually serves as a reflector of the electromagnetic energy that is flows from the transmitter to the feedhorn via the waveguide. It is a directional antenna, meaning that the beam of radar energy is focused rather than sent everywhere.**

RADAR FEEDHORN/WAVEGUIDE

- **The feedhorn is the end of the waveguide assembly that directs the electromagnetic energy at the antenna dish. The feedhorn is the true “antenna” of the system. The waveguide is a hollow, rectangular, tube that carries the radar signals from the transmitter to the feedhorn.**
- **It is very important that the various components of the waveguide are perfectly aligned. It is also very important that the waveguide and feedhorn are free of any distortions or bends. Even minor bending of the waveguide can severely hamper proper radar system performance.**

Feed Horn



DEHYDRATOR/COMPRESSOR

- **The Dehydrator-Compressor provides dehydrated air for the pressurization of the waveguide. Dry air is used for keeping the internal part of the waveguide assembly moisture free and to aid in properly conducting the RF energy being transmitted.**



DEHYDRATOR/COMPRESSOR (cont'd)

- **It is an automatic air dehydrator. If the air inside the waveguide reaches under 5.0 PSI the air dehydrator will automatically pressurize the air to 6.0 PSI.**
- **Monitor the unit's duty cycle monthly. The duty cycle can be viewed on the display on the front panel by pressing the black button. The system should be configured so that a 2-10% duty cycle is achieved. The unit must cycle several times after it has been turned on before the duty cycle can be established.**

DEC ALPHA STATION

- **The Digital Equipment Corporation (DEC) ALPHA station is the workstation that EDGE™ runs on. It can either be setup as a standalone or by networking two or more DEC ALPHA stations together.**



EDGE™

- **Unix based, powerful, user-friendly software application for displaying weather data and controlling weather radar systems.**
- **Provides a point and click interface that is simple to use.**
 - **Windows interface**
- **Provides comprehensive data and system control capabilities.**
 - **Interrogation of weather data**
 - **Technician support elements**
- **There are three (3) separate logons to EDGE™.**
 - *root*
 - *edgesys*
 - *edge*

ROOT

- **Allows you to perform various administrative tasks using windows or dterm windows with Unix language.**
- **Able to perform a full system back up, a system upgrade or reinstallation, file management, as well as various other administrative tasks.**
- **Information on various *root* tasks can be found in chapter one of the EDGE™ Operations Manual.**
 - **Level 0 Dump**
 - **Full system reinstallation**
 - **Overlays/Underlays**

FULL SYSTEM BACKUP

- **Better known as a Level 0 Dump**
- **Performed using the *root* logon**
- **Should be performed by Administrator or personnel possessing knowledge of Unix commands**
 - **Instructions located in chapter 1 of the EDGE™ Operations Manual**
- **Used to backup computer utilizing a DAT Tape.**
- **Information on completing a Level 0 Dump can be found in Chapter**
 - **1-3-2 of the EDGE™ Operations Manual**
- **Used when the Digital or Compaq Tru64 UNIX Operating System is not functional or when a new System hard disk has been installed.**
 - **Requires Compaq Tru64 UNIX Operating System CD-ROM**
 - **Current Level 0 Dump Dat Tape**

In depth instructions can be found in the EDGE™ Operations Manual 1-3

OVERLAYS / UNDERLAYS

- **Used to define objects and themes that are to be viewed on the EDGE™ Product Display window when logged on as *edge*.**
- **Produce a complete set of overlays to be utilized by the EDGE™ processing system.**
- **Produce the following overlay and underlay files:**
 - **30umas - 30 kilometer underlay file**
 - **30omas - 30 kilometer overlay file**
 - **60umas - 60 kilometer underlay file**
 - **60omas - 60 kilometer overlay file**
 - **120umas - 120 kilometer underlay file**
 - **120omas - 120 kilometer overlay file**
 - **240umas - 240 kilometer underlay file**
 - **240omas - 240 kilometer overlay file**
 - **480umas - 480 kilometer underlay file**
 - **480omas - 480 kilometer overlay file**

EDGESYS

▪The EDGE™ Configuration Program creates the EDGE™ environment and menu. To access the *Configuration Menu*, login as: edgesys with the current password. The *EDGE™ Configuration Menu* will appear. The various functions are discussed below in brevity, and are further discussed in Section 2-1 of the *EDGE™ Operation Manual*. Subfunctions under each configuration menu topic are also explained in Section 2-1.

CONFIGURATION MENU

- **Network Configuration** - The *Network Configuration Menu* is used to create a Network List. The Network List contains the individual names and IP Addresses of all computers connected to the EDGE™ System. The operator will note that the correct Hostname, Sitename, and IP Address for the METMF(R) machine were entered in the Network List when EDGE™ was installed. To open the *Network Configuration Menu*, press the *Network* button.
- **Radar Parameter Configuration** - The *Radar Parameter Configuration Menu* is used to set up the interface with the radar. To open the *Radar Parameter Configuration Menu*, press the *Radar* button.
- **Host Configuration** - The *Host Configuration Menu* allows the user to set up overlays and underlays for the host computer. The user can also set the path for the EDGE™ library. To open the *Host Configuration Menu*, press the *Host* button.

CONFIGURATION MENU (cont'd)

- **License Menu** - The *License Configuration Menu* displays all the optional EDGE™ programs for which individual licenses must be obtained from EEC. A program line entry will read LICENSED if one has been issued for a particular program. If not, the entry will read, UNLICENSED. To open the *License Configuration Menu*, press the *License* button on the *EDGE™ Configuration Menu*.
- **Noise Sample** - EDGE™ can be set up to take a noise sample of the radar receiver at various times designated by the user. The noise sample average establishes a relative receiver noise level. To open the *Noise Sample Menu*, press the *Noise* button.
- **Signal Processor** - The *Signal Processor Menu* allows the user to configure different signal processor. For the METMF(R) System the *ESP-7 Menu* will appear. To open the *Signal Processor Menu*, press the *Sig Proc* button.

CONFIGURATION MENU (cont'd)

- **Utilities** - The *EDGE™ Utilities Menu* contains utilities that test and configure the signal processing board. Utilities include port testing, automatic set up, signal processor testing, and trigger set up. To open the *EDGE™ Utilities Menu*, press the *utility* button. More information regarding the thirteen utilities (includes checks, tests, and set up procedures) can be found in the *EDGE™ Operation Manual*,
Section 2-1-7.
- **Automatic Calibration** - The *Automatic Calibration Menu* is used to automatically calibrate the radar display intensity levels to the Radar Receiver. To open the *Automatic Calibration Menu*, press the *Cal* button. The correct Radar values for the selected pulse width are automatically placed in the text entry windows of the *Automatic Calibration Menu* and need not be altered. The eighteen menu components are further discussed in Section 2-1-8 of the *EDGE™ Operation Manual*.

CONFIGURATION MENU (cont'd)

- **Clutter Map Creation** - The *Clutter Map Menu* is used to create Clutter Maps for individual Process Configuration files previously created in the *Process Configuration Menu* within the EDGE™ program. To open the *Clutter Map Menu*, press the *Clutter* button. The ten components of the menu are further discussed in Section 2-1-9 of the *EDGE™ Operation Manual*.
- **Subcatchment Creation** - The Subcatchment Area Definition process occurs in the edgesys program. The process is divided into several parts and consists of several menus. Subcatchment operation occurs in the EDGE™ program and is described in Section 3-1-12 of the *EDGE™ Operation Manual*. The *Subcatchment Area Definition Menu* is used to create Subcatchment Areas within the radar site's area of surveillance shown in the Subcatchment Map Display Window at the bottom of the menu. To open the *Subcatchment Area Definition Menu*, press the *Sub C* button. The menu consists of five menu command buttons at the left side of the menu, a large and a small text entry window at the top right of the menu, and a large map display of the coverage area at the bottom of the menu. Section 2-1-10 of the *EDGE™ Operation Manual* further discusses all of those functions.

CONFIGURATION MENU (cont'd)

- **Radar Executive Window** - The *Radar Executive Menu* displays some of the possible commands useful in the window. To open the *Radar Executive Menu*, press the *Rex* button, which produces a window containing a *rex d)* prompt. Executing the *help* command will produce a window with all of the executable commands. The Radar Executive Window allows access into the Central Command Processor.
- **Sample Window** - Pressing the *Sample* button will produce a window that displays the Sample Log Receiver Noise and Linear Receiver OffSet information. For the ESP-7, the command acronym is *Parm*.
- **Status Window** - The *Status Menu* displays various radar operating and status parameters. To open the *Status Menu*, press the *Status* button. The five menu component functions and status indicators are discussed in Section 2-1-13 of the *EDGE™ Operation Manual*.

CONFIGURATION MENU (cont'd)

- **Overlay Conversion Utility** - The EDGE™ Overlay Utility converts overlays/underlays from a Tagged Image File Format (TIFF) image format into the image format used by EDGE™. To open the *Overlay Conversion Menu*, press the "Overlay" button. A myriad of menu components and conventions are further discussed in Section 2-1-18 of the *EDGE™ Operation Manual*.
- **Scope Utility** - The A-Scope Utility display is a real-time display to adjust and experiment with different radar parameters. The display can facilitate establishing scan set-ups that work best with the current weather data.

EDGE

- **Displays weather data received by the RADAR.**
- **Use various tools within *edge* to:**
 - **Change the color scale**
 - **Archive products.**
 - **View live data as well as recently received data.**
- **Interrogation of weather is also available by utilizing the surveillance mode.**
- **Information on various *edge* tasks can be found in chapter three of the EDGE™ Operations Manual.**

EDGE™ OPERATION MENUS

- **Process Configuration** -- Used to create Process Configuration files. The *Scheduler (which we will discuss later)* uses Process Configuration files to create data volumes. Press the {*Proc*} button to open the Process Configuration menu. Set the various parameters required by the video signal and radar control processors, such as Pulse Width, PRF, Unfolding, Gate Width, and antenna speed.
- **Scheduler Menu** - The Scheduler Menu controls a program responsible for system scheduling. The Scheduler Menu controls data volume scan, data volume generation, and Product generation. It does this by executing script from one or more of the Process Configuration files and Product Configuration files at scheduled times. If more then one Process Configuration file is scheduled for a single job, the resulting data volumes known as a hybrid data volume. Hybrid data volumes are only for use in the generation of PPI scan type data Products.
- **NOTE:** The Process Configuration files do not have to have the same parameters. Press the {*Sched*} button to open the Scheduler Menu.

EDGE™ OPERATION MENUS (cont'd)

- **Color Table Menu** - Allows selection, modification, and creation of color tables by use of as many as 32 color boxes in which to display color tables. *In an 8-bit color system*, Intensity, Velocity, Spectral-Width, Echo Tops, Hydrometer, Track/Gust. And 3-D are allocated their own user-defined color table. *In a 24-bit color system*, Intensity, Velocity, Spectral-Width, Rain Rate, Rainfall, Vertically Integrated Liquid, Radial Shear, Combined/Azimuthal Shear, Echo Tops, Hydrometer, and Track/Gust are allocated their own user-defined color table. The red, green, and blue values for each color table table segment (color box) can be modified with RGB Color sliders to define the desired color for that segment or color box. In addition, the colors between any two or more color boxes can be interpolated. Color interpolation fills in the segments (boxes) between the two selected segments of the color table with intermediate colors that gradually change from the first color to the second. Press the {Colors} button to the open the Color Table Menu.

EDGE™ OPERATION MENUS (cont'd)

- **Surveillance Scan Menu** - The A-Scope Utility presents real-time live display. Use it to experiment with different radar parameters and establish scan setups that work best with the current weather data. The {Surv} button is only available on the EDGE™ Main Display when the workstation to the radar communication link is adequate to handle the large quantity of information required for real-time live display. If available on your workstation, press the {Surv} button.
- The menu components are
 - {Display} -Select one of the following:
 - {Z}- The intensity PPI display will appear in the Display window with a color scale in dBZ for the display
 - {U}- The Uncorrected Intensity PPI display will appear in the Display window with a color scale of dBZ for the display
 - {V} The Velocity PPI display will appear in the Display window with a color scale in m/s for the display
 - {W} The Spectral-Width PPI display will appear in the Display window with a color scale in m/s for the display

EDGE™ OPERATION MENUS (cont'd)

- **Surveillance Scan Menu cont'd**
 - **{Display} cont'd**
 - **{Zdr}-{Optional}-** Present only when the software is licensed and the radar has a functional Polarization switch that can provide data for a Differential Reflectivity moment. When selected the Differential
 - **{A-Scope}** An A-Scope display will simultaneously appear in the Display window for each of the default moments: Corrected Intensity(Z), Uncorrected Intensity(U), Velocity(V), and Spectral-Width(W). In radar systems equipped with a polarization switch, the Differential Reflectivity(Zdr) moment will also be available. If the operator places the cursor within an A-Scope display of a given moment and presses the left mouse button, the range and the magnitude represented by the cursor's position will appear to the right of the A-Scope display. The range will be in km, and the magnitude will be in dB, dBZ, or M/S as appropriate for the moment involved.

EDGE™ OPERATION MENUS (cont'd)

- **Surveillance Scan Menu cont'd**
 - **{Display} cont'd**
 - **{Print}** -- When selected, the image in the Display window will print
 - **{Save}** - EDGE™ will save the Display window image to the RTImg file on the system disk. A piclet of that image will appear when RTImg piclets are displayed in the Product Selection window at the top center of the EDGE™ Main Display.
 - **{Source}**- Select one of the following:
 - **{Antenna}**- Antenna becomes the source of real data for the workstation.
 - **{Soft1}**- The software simulator #1 becomes the source of simulated data for the workstation.
 - **{Soft2}**- The software simulator#2 becomes the source for simulated data fir the workstation.
 - **ON/OFF buttons**- Three buttons that control the power to various Radar system components.
 - **{Radar Power}**- Turns Transmitter and Receiver power on or off.
 - **{Servo}**- Turns the Servo power on or off
 - **{Radiate}**- Turns the radiate mode of the Radar Transmitter on or off

EDGE™ OPERATION MENUS (cont'd)

- **Surveillance Scan Menu cont'd**
 - **{Noise}**- Shows an immediate noise sample of the radar receiver.
 - **{Config}**- Press the {Config} and the Signal Processor Menu appears.
 - **NOTE:**More on the Signal Processor menu can be found in paragraph 2-1-9, Signal Processor Menu in the EDGE™ Operations Manual.
 - **{Default}**- Choose from one of several default configurations.
 - **{Samples}**- Select the slider to set the number of samples 4-255.
 - **Samples** are the number of radar pulses per Ray of Antenna Sweep.
 - **NOTE:** More on Ray Width can be found in paragraph 3-2-3 of the EDGE™ Operations Manual.

EDGE™ OPERATION MENUS (cont'd)

- **Archive Menu**- This menu is used to archive products and data volumes.
 - This can be done utilizing either {Display}, {Tape}, and {Disk}.
 - These are found on the Product Configuration and the Process Configuration Subset menus of the Scheduler, the Process Configuration menu of the EDGE™ Main Display, the Subsequent menu of the EDGE™ Main Display, and the drop down menu of the EDGE™ Main Display {Prod} button.
- **Color Scale Menu**--Allows the adjustment of meaning assigned to the different colors. Press the {Scale} button to open the Color Scale menu.
 - The operator can determine which data intervals for a selected moment are mapped to which colors.
- **Real Time Display Menu**--Allows for the selection of various real time data products to be displayed on the main Product Display window. Press the {Live} button to view drop down menu.
 - {Z}: Presents the Corrected Intensity Real Time display in the {Selected} Product Display window.

EDGE™ OPERATION

MENUS (cont'd)

- **Real Time Display Menu (cont'd):**
 - **{U}: Presents the Uncorrected Intensity Real Time display in the {Selected} Product Display window.**
 - **{V}: Presents the Velocity Real Time display in the {Selected} Product Display window.**
 - **{W}: Presents the Spectral Width Real Time display in the {Selected} Product Display window.**
 - **{R}: Presents the Rainrate Real Time display in the {Selected} Product Display window.**
 - **{Zdr}: Only present when software is licensed and the radar has a functional Polarization switch. Presents the Differential Reflectivity Real Time display in the {Selected} Product Display window.**
 - **{A-Scope}: Presents the the A-Scope display for each of the four Real Time data display options listed above. Always presented in the left Product Display window.**
 - **{Cancel}: Cancels the {Live} drop down menu.**

EDGE™ OPERATION MENUS (cont'd)

- **Product Display Menu**- Press {Prod} and a drop down menu appears with various product outputs to display given.
 - {PPI} (Standard) Plan Position Indicator
 - {CAPPI} (Standard) Constant Altitude Plan Position Indicator
 - {ETOPS} (Standard) Echo Tops
 - {EBase} (Optional) Ebase Section
 - {Base} (Standard) Base
 - {VIL} (Standard) Vertically Integrated Liquid
 - {PCP} (Standard) Precipitation
 - {Col Max} (Standard) Column Maximum
 - {HMax} (Standard) Height of Maximum Intensity
 - {RHI} (Standard) Range Height Indicator
 - {LRA} (Standard) Layer Refractivity Average
 - {Flash Flood} (Optional) Flash Flood
 - {Hail Signal} (Optional) Hail Signal

EDGE™ OPERATION MENUS (cont'd)

- **Product Display Menu (cont'd)**
 - {Hail Prob} (Optional) Hail Probability
 - {Track} (Optional) Storm Cell Tracking
 - {Gust} (Optional) Gustfront Detection
 - {Vector} (Optional) Automatic Storm
 - {CMM} (Optional) Combined Moment Map
 - {TVAD} (Optional) Tangential Velocity Assumed Display
 - {Alert} (Optional) Alert
 - {XSEC} (Standard) Cross Section
 - {RTImg} (Standard) Real Time Image piclets appear
 - {Date/Time} (Standard) All product piclets from the same data volume appear
 - {Quad} (Standard) Monitor splits into 4 image fields
 - {WARN} (Optional) Weather Analysis Radar Network menu appears
 - See Paragraph 3-1-2-3 of the EDGE™ Operations Manual
 - {Subsequent} (Standard) Subsequent menu appears. See paragraph 3-1-2-4/
 - {Delete} (Standard) Highlighted piclet selected from the product selection window.

EDGE™ OPERATION MENUS (cont'd)

- **Built In Test Equipment:** {BITE} presents a number of colored binary indicators, each of which indicate the status of associated parameters.
- **WMO Menu:-** Allows the user to add various WMO weather symbols to selected weather product displays.
- **Overlay Menu:-** Only present on EDGE™ systems with an 8-bit video card. Allows the operator which overlays and underlays to view from the radar.
- **Configuration Menu:-** Enables setting up of parameters for Movie Loops, Accumulated Precipitation, and measurement Units.

EMBARKATION/PACKUP



EMBARKATION/PACKUP (cont'd)

- The radar pedestal must be packed last, since it will be stowed immediately inside the door of the shelter.



EMBARKATION/PACKUP (cont'd)

- **Forklift Method.** These steps describe the method used when a forklift is available. The following special equipment is required:
 - **Radar pedestal carriage.** The carriage has securing straps and guideline straps attached to it.
 - **Forklift attachment.** The forklift attachment consists of an aluminum sleeve that fits onto a single forklift tine.
- **Attached to the sleeve is an eyebolt.** The eyebolt has four cables attached to it that have pelican hooks on the end. The four cables are of two different lengths. This is for balance when attached to the carriage, since the center of gravity is offset. They are marked Fore and Aft. Fore is the portion of the carriage where the motor housing rests.

EMBARKATION/PACKUP (cont'd)

- **STEP 1: Remove power from Racks 5 and 6. Switch the left pedestal toggle switch from Operate to SAFE. Disconnect the antenna power/data cable and grounding wire from the pedestal. Remove Interlock Shorting Plug and store with waveguide.**
- **STEP 2: Disconnect the waveguide from the lower pedestal union and Radar Egress Panel and place it in box RADRWAVE. Place plastic caps over exposed waveguide openings. Handle waveguides with extreme care to prevent damage.**

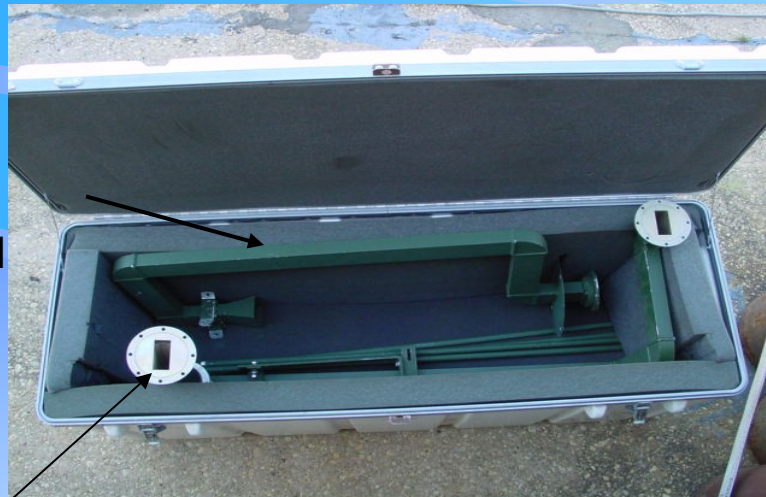
DISCONNECT



EMBARKATION/PACKUP (cont'd)

- **STEP 3: Remove the feedhorn braces and the feedhorn from the dish and place in box RADRFEED.**

**FEED
HORN**



RADAR WAVEGUIDE

EMBARKATION/PACKUP (cont'd)

- **STEP 4: Rotate the dish so that it is pointing straight up. Disconnect the flexible waveguide from the rear of the dish and the pedestal. Disassemble the pieces and place in box RADRWAVE. Replace plastic caps over all openings.**
- **STEP 5: Disconnect the dish and lower. Two personnel are required to lower the dish (75 lbs.) and two to receive it. The dish is bolted loosely (to allow for shelter flexing) to brackets inside the shelter. The dish must be bolted in the shelter before proceeding with other packing, or the mounting brackets will be inaccessible.**

EMBARKATION/PACKUP (cont'd)

- **STEP 6: Disconnect the counterweight arms and place in box RADRWAVE. Place plastic covers on pedestal and waveguide attachment points.**

COUNTER
WEIGHTS



WAVEGUIDE
W/ FLEXIBLE
WAVEGUIDE

EMBARKATION/PACKUP (cont'd)

- **STEP 7: Position the forklift at the forward roadside corner so it faces the point of the corner. The forklift laces its forks into the sleeves located on top of the radar pedestal platform.**
 - **NOTE: There are four bolts attaching the ears to the sides and a fifth bolt at the ISO corner. Leave all in place until the forklift has its tines in the sleeves.**
- **STEP 8: Remove the bolts that attach the radar pedestal platform ears to the shelter sides. The forklift should now lift the platform up very slightly (approximately 1 to 2 inches) and then back away from the shelter approximately a foot. This is to relieve pressure on the platform ears. Then the entire platform can be lifted above the shelter and the forklift can back away.**
 - **NOTE: There are four bolts attaching the platform ears to the sides of the shelter and a fifth bolt at the ISO corner. Replace the four side bolts in the shelter side once the platform is removed.**

EMBARKATION/PACKUP (cont'd)

- **STEP 9:** The forklift places the entire assembly on the ground and removes its tines from the sleeves on the platform. Remove the bolts from the base of the pedestal.
- **STEP 10:** Attach the hooks of the forklift attachment to the eyebolts located on the top of the pedestal. The four cables are of two different lengths. Ensure one of each length is attached to each eyebolt. All cables must run through the square feedhorn opening on the pedestal elevation housing.
- **STEP 11:** The forklift now places a single fork into the attachment and lifts the pedestal up from the pedestal platform. Move the platform out of the way, and pack in the shelter. Lower the pedestal to the ground, but have the forklift maintain upward tension on the pedestal assembly. This is to facilitate placing the carriage on the pedestal. Attach the carriage to the pedestal using the cargo straps attached to the carriage.

EMBARKATION/PACKUP (cont'd)

- **NOTE:** The motor housing must be aligned with the lower waveguide attachment. The cargo straps are run under the pedestal carriage grasping rails. The straps that secure the pedestal to the carriage must NOT cross the pedestal local control (lower) panel (where the SAFE/OPERATE toggle switch is located). Ensure the strap stays above the upper lip of the panel.



EMBARKATION/PACKUP (cont'd)

- **STEP 12: Lower the pedestal and carriage to the ground using the guidelines attached to the carriage to steady the whole assembly.**
- **STEP 13: Remove the attachment from the forklift tine, then disconnect the cables from the eyebolts.**
- **STEP 14: Attach the cables to the four rings located on the inside of the carriage. Two rings are located in the front (near the motor housing) and two in the rear (near the pedestal base). The four cables are two different lengths. Ensure that the two short cables marked FORE are attached to the front carriage rings and the cables marked AFT are connected to the rear rings near the pedestal base.**

EMBARKATION/PACKUP (cont'd)

There are three different ways to load the pedestal into the METMF(R): fork lift, ramp, and manual

A. Fork lift.

- STEP 1. Holding the forklift attachment sleeve up above the motor housing, have the forklift insert one fork into the sleeve (for a Terex this must be the right fork). No more than 3 feet of the fork should go through the sleeve. This is to allow clearance between the forklift and the shelter when the carriage is placed inside.**

EMBARKATION/PACKUP (cont'd)

- **STEP 2: Lift the entire pedestal carriage assembly up far enough to clear the lower lip of the shelter door. This may vary depending on ground slope, dunnage beneath the shelter, or the use of levelers.**
- **STEP 3: Once the carriage is on the deck lower the fork enough to remove the sleeve. Leave the sleeve and cables attached to the carriage. Set the wheel brakes on the carriage. Also, set locks for each wheel to keep wheels straight. Secure the carriage using two cargo straps attached to deck fittings.**

EMBARKATION/PACKUP (cont'd)

- **B. Carriage Rails**
 - **STEP 1: Place the carriage rails on the lip of the shelter door. The large plated end goes on the ground and acts as support and as a guide to get the carriage wheels into the rails.**
 - **NOTE: At this point the shelter must be completely packed. The ECUs should be shut down; the intake/exhaust plenums removed and packed inside the shelter. The carriage should be the last item placed in the shelter. Ensure that the carriage is centered directly on the door and the wheels lined up with the rails.**

EMBARKATION/PACKUP (cont'd)

- **NOTE: Do not attempt to place the carriage into the door from an angle. Once in position, lock the carriage wheels facing forward. Care must be exercised to prevent the carriage assembly from snagging or catching on the cargo straps already in place.**
- **STEP 2: Two Marines can roll the entire carriage up the ramp and into the shelter.**
- **STEP 3: Once the carriage is inside, secure the carriage using cargo straps attached to deck fittings. Leave the forklift sleeve and cables attached to the carriage.**
- **STEP 4: The carriage rails are secured inside the shelter door to the right.**

EMBARKATION/PACKUP (cont'd)

- **C. Manual Method**
 - **The manual lift method shall only be attempted as a wartime field expediency and at no time should be considered the preferred method of lifting the pedestal. The manual lift method is only for placing the pedestal carriage inside the shelter.**
 - **Once the pedestal is placed in the carriage and the carriage is on the ground it may be manually lifted in the shelter. This requires five personnel, one to be in the shelter and four to lift the carriage. Begin by wheeling the front of the carriage (the pedestal motor housing) to the door.**

EMBARKATION/PACKUP (cont'd)

- Using the rails on the side, all five personnel lift only the front wheels up into the shelter. Moving back, the four personnel outside lift the rear of the carriage and roll it forward to place it inside. The fifth man positions it and secures the carriage for shipping. Exercise caution with the fifth man inside, due to the lack of space to maneuver.**
- To prevent personnel injury, four-man lift is required for each end of the pedestal carriage. If the carriage is to be lifted entirely, eight-man lift shall be used. This requirement is based on the National Institute for Occupational Safety and Health (NIOSH) lifting equation.**

DEBARKATION/UNPACKING

- **Radar Unpacking Procedures. Equipment required:**
 - **Forklift**
 - **Hand tools (sledgehammer, socket set, boxed and open end wrenches, adjustable wrenches, Allen wrenches, flat tip and Phillips screwdrivers)**
- **The pedestal carriage should be stowed inside the shelter with the forklift attachment attached to it. Doing so facilitates the removal of the carriage.**

DEBARKATION/UNPACKING

(cont'd)

- **STEP 1: Remove the two cargo straps that secure the carriage to deck points inside the shelter. During the following steps involving the forklift there shall be a designated director who directs the forklift driver. During portions of this procedure the driver may not be able to see pedestal and will rely on directions from the director.**
- **STEP 2: Holding the forklift attachment sleeve up above the motor housing, have the forklift insert one fork into the sleeve (for a Terex this must be the right fork). No more than 3 feet of the fork should go through the sleeve. This is to allow clearance between the forklift and the shelter.**

DEBARKATION/UNPACKING

(cont'd)

- **STEP 3: Lift the entire pedestal carriage assembly up far enough to clear the lower lip of the shelter door. This may vary depending on ground slope, dunnage beneath the shelter, or the use of levelers. Back the forklift away from the shelter and lower the carriage to the ground.**

NOTE: The distance between the top of the fork and the wheels of the carriage will clear the door with approximately 6 inches of clearance top and bottom. Close attention shall be paid to this clearance as the front of the carriage is moved out the door.

DEBARKATION/UNPACKING

(cont'd)

- **STEP 4: Remove the forklift attachment from the carriage and attach the hooks of the forklift attachment to the eyebolts located on the top of the pedestal. The four cables are of two different lengths. Ensure one of each length is attached to each eyebolt. All cables must run through the square feedhorn opening on the pedestal elevation housing**
- **STEP 5: The forklift now places a single fork into the attachment and lifts the pedestal carriage up to the vertical. Use the two guidelines to steady the carriage as it is raised. Once the pedestal is upright, detach the carriage from it.**

DEBARKATION/UNPACKING

(cont'd)

- **STEP 6: Move the radar pedestal platform under the pedestal and lower the pedestal on to it. Ensure that the panel with the radar waveguide attachment is aligned with the right side of the platform (the platform is triangular so right is from the perspective of standing on the long side looking toward the point with the hole in it).**
 - **NOTE: Keep upper tension on the pedestal for ease in positioning, so that the three bolt holes align. Once the bolts are started the fork can be lowered enough to remove the forklift attachment. Secure the pedestal to the platform.**

DEBARKATION/UNPACKING

(cont'd)

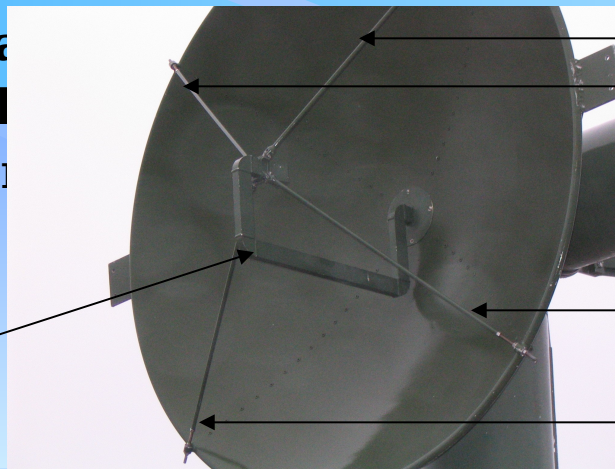
- **STEP 7:** The forklift now places its forks into the sleeves located on top of the radar pedestal platform (the 45-degree point of the platform should be pointed towards the forklift). The forklift lifts the platform up and moves to the forward roadside corner of the shelter.
- **STEP 8:** Position the forklift at the forward roadside corner so it faces the point of the corner.
- **STEP 9:** The forklift places the entire assembly on the corner of the shelter. A sledge may be required to align the bolt holes. If a sledge is used, wood should be placed against the area being struck. This will prevent damaging the platform or chipping the paint.
- **STEP 10:** Lubricate and insert the bolts for the radar pedestal base into the base and tighten. The pedestal platform should be secured before the forklift removes its forks from the sleeves on the platform.
 - **NOTE:** There are four bolts attaching the ears to the sides and a fifth bolt at the ISO corner

DEBARKATION/UNPACKING

(cont'd)

- **STEP 11:** Connect the counterweight arms.
- **STEP 12:** Assemble the flexible waveguide. Handle all waveguides with extreme care to prevent damage. Store all waveguide plastic end covers in the box.
- **STEP 13:** The dish faceplate should be pointing straight up. Lift the dish to set on top of the faceplate and connect the dish to the faceplate. Two personnel are required to lift the dish (75 lbs) to the roof of the shelter and two to receive it.
- **STEP 14:** Manually rotate the dish back to the vertical and attach the feedhorn and the feedhorn braces to the front of the dish. Attach the pre-assembled flexible waveguide to the rear of the dish and to the pedestal.

FEED HORN



FEED HORN
BRACES

DEBARKATION/UNPACKING

(cont'd)

- **STEP 15: Connect the long waveguide to the lower pedestal panel and to the ECU/Radar Egress Panel waveguide connection.**
- **STEP 16: Ensure radar power is shut OFF at Rack 10, connect the antenna power/data cable and grounding wire to the pedestal and the ECU/Radar Egress Panel. Level the radar pedestal. Install Interlock Shorting Plug.**
- **STEP 17: Switch the left pedestal toggle switch from Safe to Operate. Ensure personnel are cleared from topside of shelter.**
- **STEP 18: At Rack 10, apply power to the radar**

QUESTIONS

- **What is the frequency of the AN/TPS-76 Radar?**
 - **5.3-5.7 GHz**
- **How many different logons are there for the EDGE™ software and what are they?**
 - **3: edge, edgesys, root**